LITE-ON SEMICONDUCTORS

LT431

ADJUSTABLE PRECISION SHUNT REGULATOR

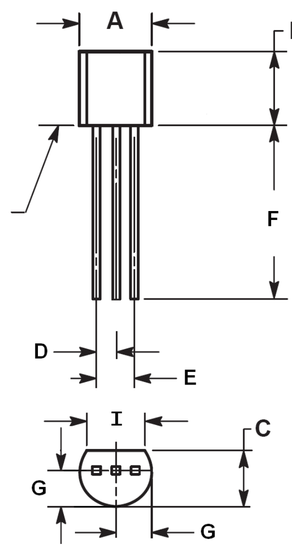
GENERAL DESCRIPTION

The LT431 is a low voltage three terminal adjustable shunt regulator with a guaranteed thermal stability over applicable temperature ranges. The output voltage can be set to any value between 2.495V (VREF) to 36V with two external resistors (see application circuit). The high precise Reference voltage tolerance is ±0.5% and ±1.0% by LT431. This device has a typical output impedance of 0.2Ω. Active output circuitry provides a very sharp turn on characteristic, making this device excel lent replacement for Zener diodes in many applications.

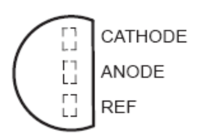
FEATURES

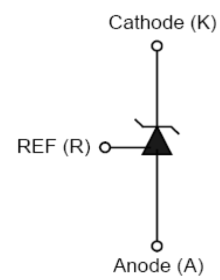
- Precision reference voltage
  LT431OHPA : 2.495V±0.5%
  LT431NHPA : 2.495V±1.0%
- Adjustable output voltage is VREF to 36V
- Sink current capability is 200mA
- Low dynamic output impedance is 0.2Ω (typ.)
- Minimum Cathode current for regulation is 0.2mA (typ.)
- Plastic material has UL flammability classification 94V-0

TO-92 (TO-226AA)



TO-92		
DIM.	MIN.	MAX.
A	4.45	4.70
B	4.32	5.33
C	3.18	4.19
D	1.15	1.39
E	2.42	2.66
F	12.7	------
G	2.04	2.66
I	3.43	-----
All Dimensions in millimeter		





Absolute Maximum Ratings (at Ta=25℃)

Characteristics	Symbol	Rating	Unit
Cathode Voltage	V_{KA}	36	V
Continuous Cathode Current	I_{KA}	250	mA
Reference Input Current	I_{REF}	10	mA
Operating Temperature	T_{OP}	-20~85	℃
Junction Temperature	T_J	-40~125	℃
Storage Temperature	T_{STG}	-40~150	℃
Thermal Resistance from Junction to ambient	θ JA	156	℃/W
Power Dissipation[PD=(TJ-TA) / θJA]	PD	0.25	W

Note : θ JA is measured with the PCB copper area of approximately 1 in2(Multi-layer).

Electrical Characteristics (T_A=25°C, unless otherwise specified)

Characteristics	Symbol	Conditions		Min	Typ	Max	Unit
Reference Voltage	V_{REF}	$V_{KA} = V_{REF}$, I_{KA} = 10mA (Fig.1)	0.5 %	2.482	2.495	2.507	V
			1.0 %	2.470	2.495	2.520	
Deviation of Reference Input Voltage over full temperature range	$V_{REF(DEV)}$	$V_{KA} = V_{REF}$, I_{KA} = 10mA, T_A = -20~85℃ (Fig.1)			6.0	20	mV
Reference Input Current	I_{REF}	R1 = 10KΩ,R2 = ∞ I_{KA}= 10mA (Fig.2)			1.5	3.5	uA
Deviation of Reference Input Current over Temperature	$I_{REF(DEV)}$	R1 = 10KΩ,R2 = ∞ I_{KA} = 10mA T_A = -20~85℃ (Fig.2)			0.4	1.2	uA
Ratio of the Change in Reference V_{KA} = 10V ~V_{REF} - -1.2 -2.0 Voltage to the Change in Cathode Voltage	ΔV_{REF} ΔV_{KA}	I_{KA} = 10mA (Fig.2)	V_{KA} = 10V ~V_{REF}		-1.2	-2.0	mV/V
			V_{KA}= 36V ~10V		-1	-2.0	
Minimum Cathode Current for Regulation	$I_{KA(min)}$	$V_{KA} = V_{REF}$ (Fig.1)			0.2	0.5	mA
Off-state Cathode Current	$I_{KA(OFF)}$	V_{KA} = 36V, V_{REF} = 0V (Fig.3)			0.1	1	uA
Dynamic Output Impedance	Z_{KA}	$V_{KA} = V_{REF}$ Frequency ≤ 1KHz (Fig.1)			0.2	0.5	Ω

Application Circuit

Fig1: V_{KA}=V_{REF}

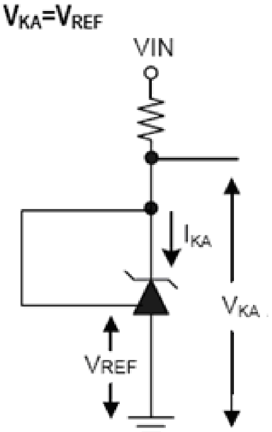
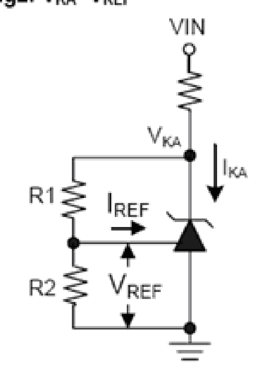
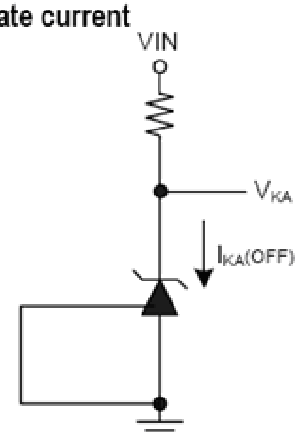


Fig2: V_{KA}>V_{REF}

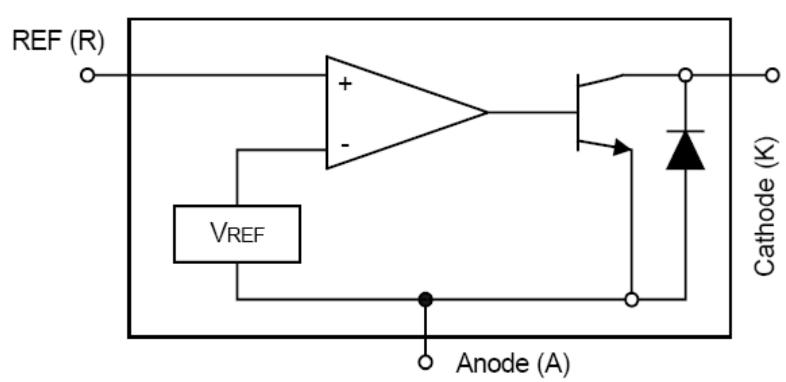


VKA=V_{REF}(1+R1/R2)+I_{REF}*R1

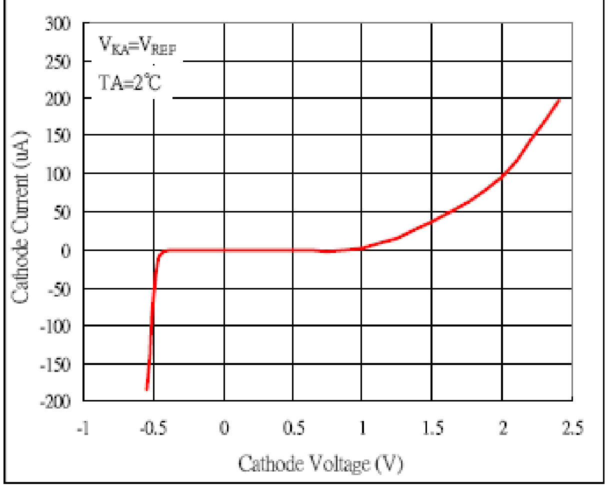
Fig3: Off state current



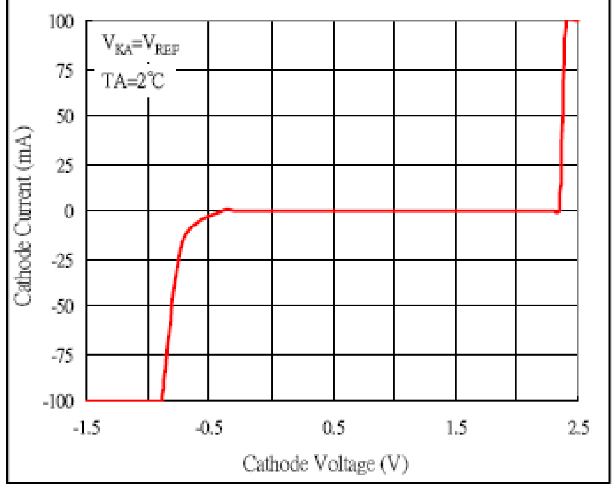
Block Diagram



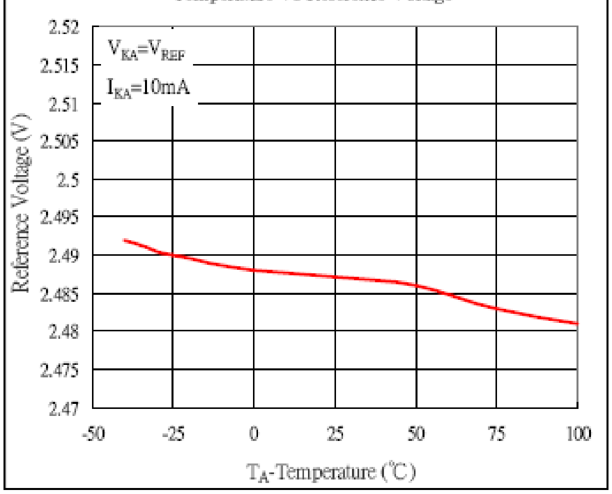
Typical Characteristics



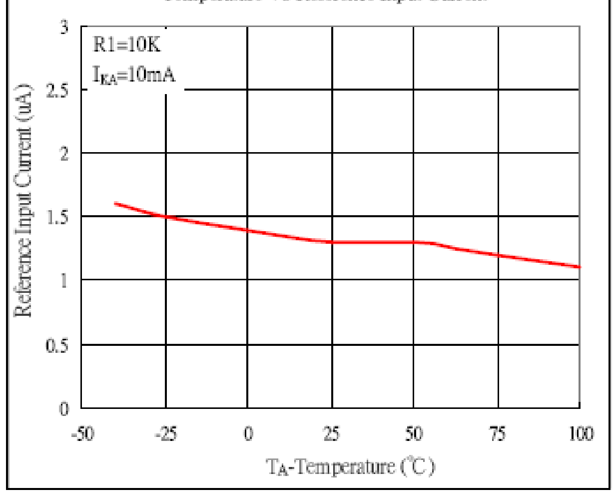
Cathode VoltageVs Cathode Current (uA)



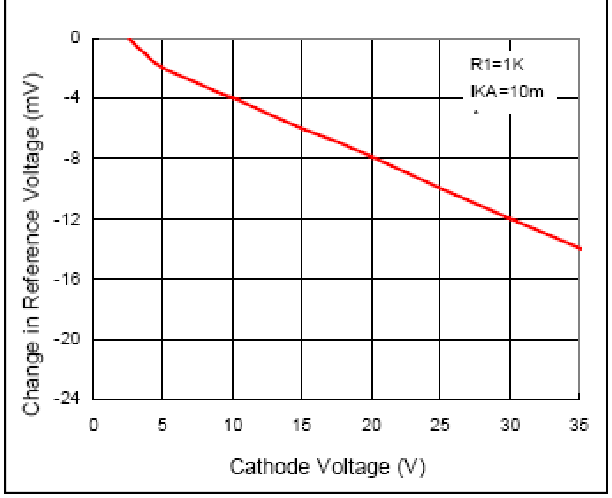
Cathode VoltageVs Cathode Current



Temperature Vs Reference Voltage



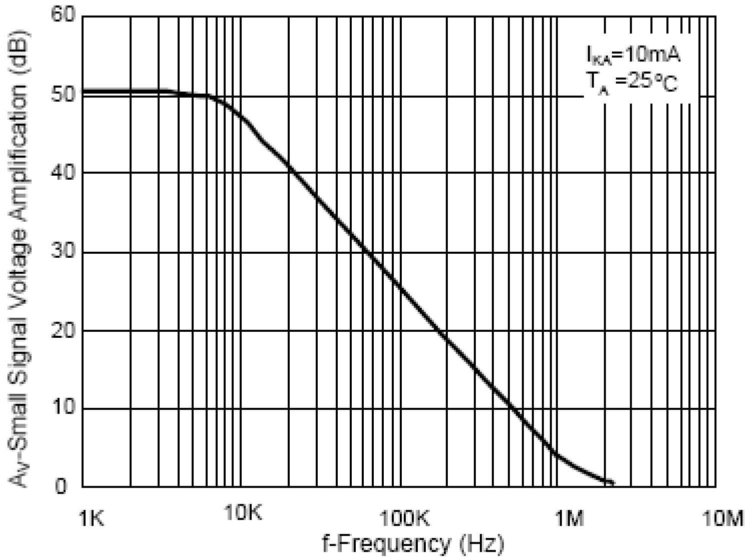
Temperature Vs Reference Input Current

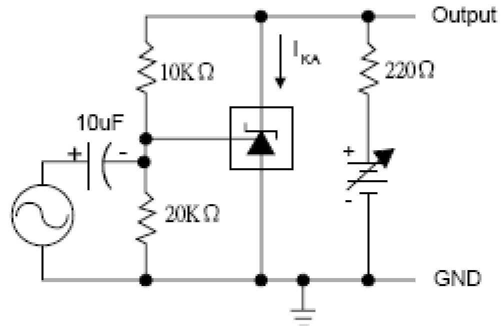


Cathode Voltage Vs Change in Reference Voltage

Typical Characteristics (Continued)

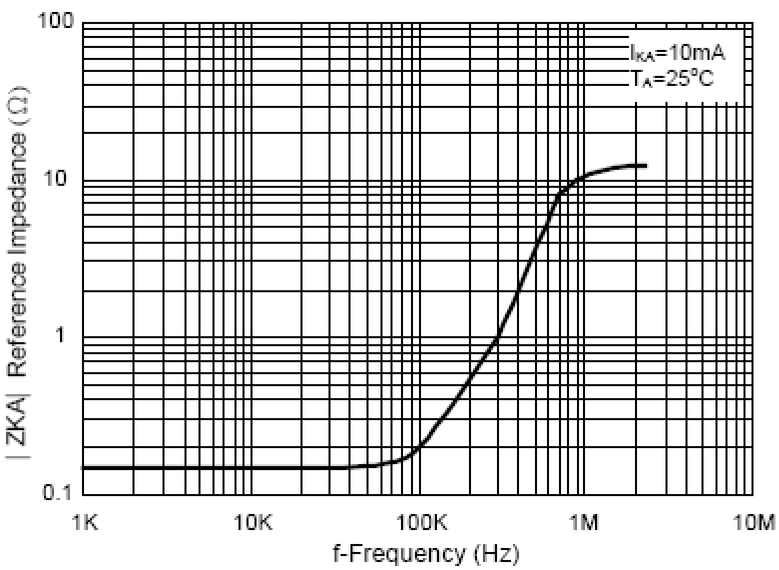
(1) Small Signal Voltage Amplification Vs Frequency

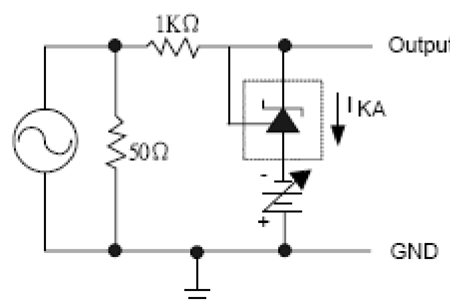




TEST CIRCUIT FOR VOLTAGE AMPLIFICATION

(2) Reference Impedance VS Frequency

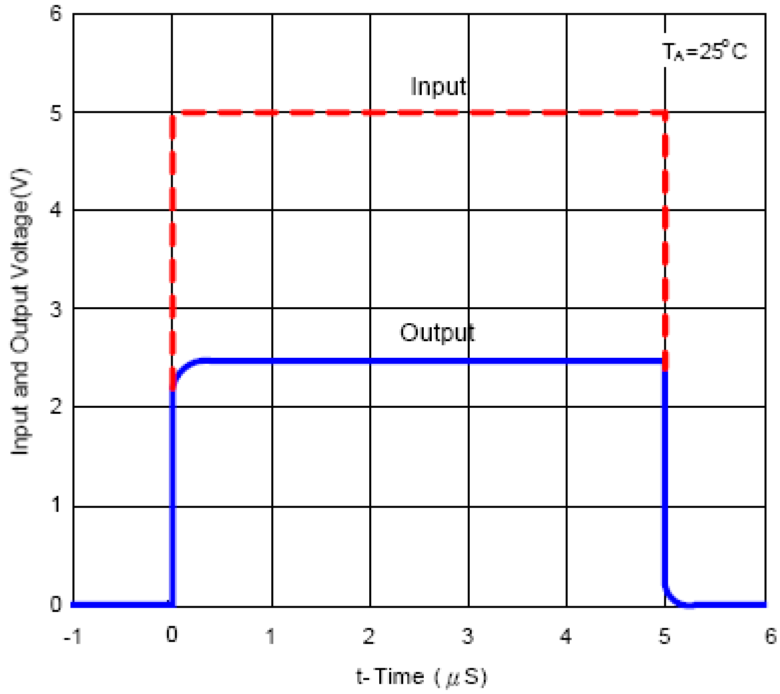


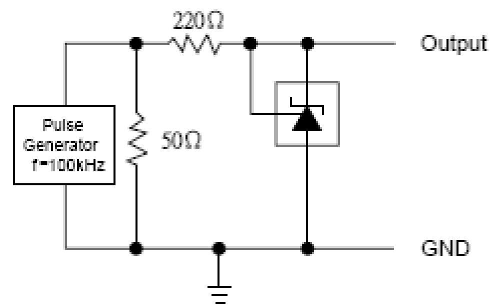


TEST CIRCUIT FOR REFERENCE IMPEDANCE

Typical Characteristics (Continued)

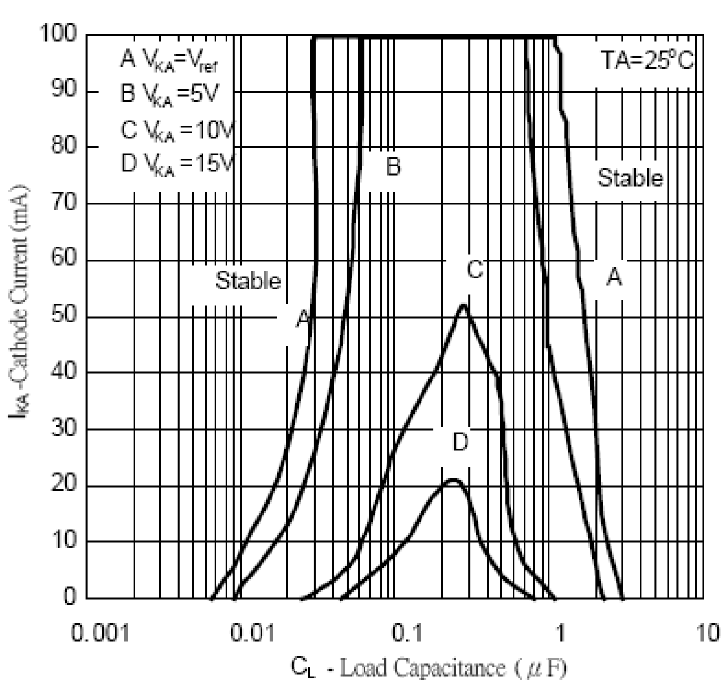
(3) Pulse Response

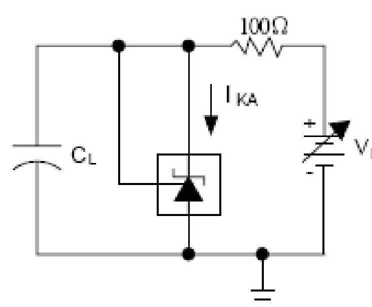




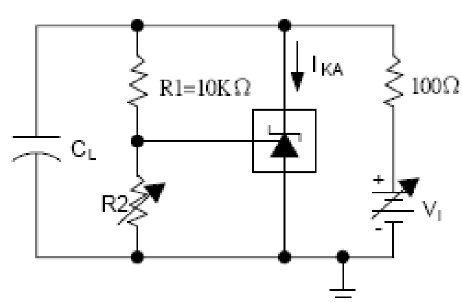
TEST CIRCUIT FOR PULSE RESPONSE

(4) Stability boundary conditions





TEST CIRCUIT FOR CURVE A



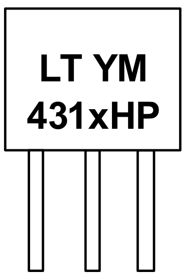
TEST CIRCUIT FOR CURVE B ,C, AND D

The areas under the curves represent conditions that may cause the device to oscillate For curves B,C, and D, R2 and V_I were adjusted to establish the initial V_{KA} and I_{KA} conditions with C_L=0 . V_{BATT} and C_L were then adjusted to determine the ranges of stability.

Ordering Information

Product Number	Output Voltage Tolerance	Package	Packing
LT431OHPA	0.5 %	TO-92	Taping & Reel
LT431NHPA	1.0 %	TO-92	Taping & Reel

Marking Information



Note:
1) YM = Date Code, Y: Year, M: Month

2) 431**x**HP = Product Number
x = O, N…
O= 0.5 %
N= 1.0 %